New EXPERIMENTS,

AND

Aleful Oblervations

CONCERNING

Sea - Water

MADE

FRESH,

According to the

PATENTEES INVENTION:

In a Discourse Humbly Dedicated to His Majesty the KING of GREAT BRITAIN, &c.

By a Fellow of the Colledge of Phylicians, and of the Royal-Society.

LONDON,

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Dilmed by John Hargin !, King Dom. 160 s.

ordinary recordance; for although the Sea be face in fome places than in Schere, 3H,TOO,Took the time a neither

KING'S Most Excellent Majesty.

May it please Your Majesty,

HE making Sea-Water Fresh, hath of late been much discours'd of, and is of great Consequence, not only with respect to Merchant-Ships, but also, as I conceive, to your Majesties Navy, and Garrisons, and to Sea-Port Towns in all parts of the World, where good Water is wanting.

All that is proper to be faid upon the Matter, will lye in

making good these three Affertions.

I. That Sea-Water may easily, safely, commodiously, in sufficient Quantities, be made Fresh for all common Uses at Sea.

Dyet, as any other Water now in use at Sea.

III. That being fo, the advantages are fuch as will much more

than countervail the charge and trouble about it.

For the Truth of the first, we have the Reputation of the Gentlemen who have your Majesties Patent for it, and their Invited also to assure Us. By an Instrument scarce a Yard over, which may stand under the Deck of any Ship, or very well in the Cook room, and all Smoak and Fire avoided; they can make about ninety Gallons in twenty sour Hours: Which at the largest Allowance, of three Quarts to a Man, being kept at bonstant working, will serve about a hundred and twenty men, although two Quarts a day, or three Pints, in time of Scarcisty, is counted a good Allowance for one man.

We are likewise assured, that it may be done with ease and ordinary attendance: for although the Sea be salter in some places than in others, yet the Operation is the same; neither is there any difference betwint that which comes first, and last. And whatever is to be put into the Engine with the Water, may as easily be done, as Salt or Out-meal into Pottage: So that one Man may serve both to make the Drink, and for other uses of the Ship.

By Mr. Boyle we are also affured, That Sea Water thus made fresh, is as wholsome to be drunk as any Water about the Town, in its best Condition. And by an Ingenious Physician of the Colledge, a proper comparison hath been made betwixt This, and the best Water. And so many of the Colledge as were defired, have not doubted to give it under their Hands, That they were

fatisfied of the Wholfownes of this Water. .

Notwithstanding which, to give the World a little more express Proof of the matter, I shall, with Your Majesties leave, undertake the same; which I think I may the more properly do, because I have no share either in the Prosit of it, or in the

Credit of the Experiment.

Now, all the Signs, which either Physicians, or common Experience, have given of the best Water, are these; via. Clear-ness, Thinness, Sweetness, Softmess, Lightness, Durableness, and Pureness or Simplicity; with all which good Qualities, if this Water stands in the first rank, I suppose no rational Man will further dispute whether it be good, or no.

The Clearues hereof, although it may be pretty well observed in a good Flint-gloss; yet I consider'd, that as there are degrees of Heat and Cold, of which our Bodies being unsensible, can only be judg'd of by a Weather glass; so there may be degrees of Perspicuity, which the Eye, unless affished, will not easily reach; as may appear by this ease Experiment.

If a few drops of Claret be put into Fresh Sea-Water, (fode as is made by the Patentees, and with which I made This, and all the following Experiments) they will give it a kind of light Hiacynthine Red. But if the same quantity of Claret be drop'd

into

into as much River-Water, and that after the Water hath stood in a Ciffern to settle a considerable time, it will look muddy, as if a drop of look had been put into it; the Claret discovering those Opacom Parts which before were not easily discern'd.

The same is likewise an Argument of the Thinness of this Water. As is also the Preparation of it by Fire; for the very Bailing of Water, is one way recommended by Hypparates, and commonly used for the Attenuating of it; that is, the Separation of any Gross and Heterogeneous Parts, which swim therein, and upon Bailing use to subside: and the greatest part of Rain-Water, which is as thin as any, is Distilled from the Sea.

Its Sweetness recommends it, both as to the Smell and Tast; for the best Water hath no seems, neither bath this any. And so for the Taste; its true, a little Alkaline sale, in the Opinion of some Water-Drinkers, gives a kind of sweetness or savouriness to Water, as salt to their Pottage; for which cause, I have known them to prefer Pump-Water before any other sore. But the best water, and that which is generally, both by Water-Drinkers, and others, most esteemed, is no otherwise sweet, than in being very safe upon the Tongue, and rather inspired; and such is this Water.

Neither doth it excell in smeetvest or softness to the Taste alone, but also to the Touch: of which quality, Dyers and Laundeeses (who are very Critical at their Finger ends) make the
best Judgment in mixing their VV star with Soap. But a different Degree of heat, or proportion of soap, will alter the case:
And therefore, to make the Tryal exact, let half a Pint of Pumpmeter be warmed to a convenient degree, and half a draches of
common soap dissolv'd therein; in doing of which, it will be
very difficult to raise a good Lather; the Water underneath it
will look muddy and unequal, as if it vvene cordied, and
when the Lather falls, it lies on the Water, or any thing it is
put upon, like Grease, yet feels hars.

The fame quantity of Seep and River-meter, and the Waterbeated to the same degree, make a high Lather, and that in a short time, and the water also under it is equal and clear,

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In all which Respects, this Fresh Sea-water doth not only equal that of the New-River, or Thimes, but excells it: For befoles, that it is rather clearer when the soap is dissolved; it also makes as strong a Lather, in a shorter time, and with less soap; insomuch, that the Woman I caused to make the Tryals, and compare them, not knowing whence I had any of the Waters, ghessed, that above a pound and a quarter of Soap would not go so far with Thames-water, as a pound would do with this Fresh sea-water.

Another Circumstance is, That if the Water be extraordinary Good, it will make a very good Lather without being heat-

ed, which this Water will also do.

This same Water is also as light as any common Water whatsoever; as may best be proved by a Water Poile, which the Italians commonly use when they would try the lightness, and
therein the goodness of their Water. For this Purpose, I mark'd
the Neck of one with several Degrees equally distant, immersed in in the seven following Waters; wherein it sunk less or
more, according to the Gravity or Lightness thereos.

In the Pump-water in Chancery-lane, (a heavy water) it hard-

ly dips to the first, or lowermost Degree.

In the Pump-water in Christ's-Hospital, just to the lower-most.

In the Conduit water in Cheapfide, to the second, or near it.

In Thames-water, New River water, Water distill'd from Spring-water, and in Fresh-sea-water, to the third, or thereabout. So that it is as light as common Water distill'd.

Neither is there any Water more durable or uncorruptible for, all Corruption in Water theweth it felf one of these four ways; either by some ill safte or smell; or by becoming muddy or turbid, or by gathering some skin or bubbles at the Top, or by letting some Sedement fall to the bottom; none of all which happeneth to this VVater, though some of it hath been kept, both in and out of the Sun, for nine Months; and without all doubt, would continue so much longer.

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The last mention'd quality of the best VV nter, was, its Puri-

I deny not, but rather contend, That there is a certain Aereal Nitre incorporated with all Water; of a different nature from Nitre commonly so call'd, and such as by no means yet known, can be visibly separated from the Water: From hence chiefly it is, I conceive, that Water obtains its cooling quality; and that when it freezes, it is not because it is then only impregnated with this Nitre, but because then the Air being surcharged, throws off a greater quantity into it: As when Water is sweeten'd or Season'd with a little Sugar, it doth not follow that there is none in it, because not enough to make it Candy. So there is of this invisible Nitre in Water, always enough to season it, though not to make it Candy, or turn to kee.

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pt, all fpets is the most simple, is also justly to be esteemed most wholfom, and always hath been so. For as the Humours of the Eye, which is the instrument, and the Air the Medium, by which we discern all Colours, ought to be themselves perfectly transparent and colourless; so Water, which is only a Vehicle to our Food, should be it self the most simple, and freest from all manner of Qualities, besides those proper to it as Water. For if it be desired at any time to be embued with any other Quality; it is with respect to some medicinal Use, and not common Dyer.

Now this Purity, or Homogeneity of Parts, doth eminently belong to this Fresh-sea-water, as I shall make it appear several ways; and therewithal, shew the Reason of its other good qualities; especially of its Sosiness, Lightness, and Incorruptibility, and Incorrup

And first, the reason of its Softness is its Purity; or its being undefiled with any kind of correspos sale, whether Alkaline, Marine, or Acid.

For upon evaporating of any hard Pump-water, most Springmaters, and River-waters, in a Glass Vessel, or one very well sufed; it is evident, that the former contains a considerable a quantity of fult: A Gallon from the Pump in Chancery-lane, which is the faltest water in this City, will yield near three Drachms; not of an Alluminess falt, as is commonly thought, but an Alkaline, with the Taste and other Properties of a Livi

vial falt.

That Spring maters, though they yield more or less of the same salt; yet in a far less quantity, and that River-maters yield the least of all: Of which three sorts of VV aters, the first are the bandest, the last the softest of any in common use; yet excelled by Fresh Soa-mater, as appears by one of the foregoing

Experiments.

Neither is there any Marine-falt herein; for, whereas half a Pint of this Frest-search, or of River-mater, and half a Drachm of common seap, will of themselves make a very good Lather; if but twelve or thirteen Grains of common salt he added to the VV ster before the seap he dissolved therein, it will curdle, and the Lather sall like Grease upon it, as if it were some harsh Pump-mater.

Nor yer any Acid: for, if you put but seven or eight drops of Onl of Virriol into half a Pint of River-mater, though you increase the former quantity of soap, yet it will never make

any Lather at all.

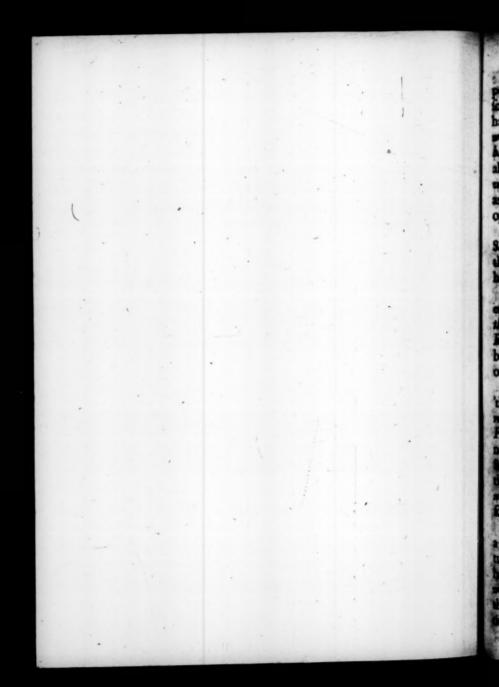
of Spirit of Salt may come off with the VV ster; if but seven or eight drops of Spirit of Salt be put to balf a Pint of River water, it will, in the same manner, hinder it from making any Lather. Nay, if but two or three drops be put into it, they will have the same effect.

So the reason why Fresh-sea-mater, as prepar'd by the Patertees, is so extream soft, is its purity, or freedom from all manner of Selts, fave only that Aerael Narre which is common to all

Water, and chiefly contributes to its cooling quality.

Or if any one should be so pertinacious, as to say, that yet there may be one Grain, or part of a Grain of Sale, or one drop or part of a drop of Sale; should thus much be grained, then in the same quantity of Themes-mater, there is a much, or more; this being a safer mater than even Themes-mater it self.

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The purity of this Water is also aren'd from its lightness. The perfect Dissolution of any Sult, or Barth, in Water, in never to small a quantity, adding weight to it. So, for Example, if half a drachm of common sult be dissolved in a Pint of Riverwater, the Water-paise will dip no lower into it than into any harsh Pump-water. So that in a Pint of such Water, there is about half a drachm of Sult and Limy-Earth, more than in Riner-water: for, although such VVater be as clear or transparent as any distill d VVater, yet in the Evaporation, some portion of Earth is always precipitated together with the sult.

So likewise, if half a drachm of Oyl of Vitriol, or Spirit of Salt, be put to a Pint of River-mater, the VVater-poise will dip therein but to the same Degree as if the same quantity of salt

had been put into it.

Since therefore the Gravity or Lightness of VV ater dependent upon the Dissolution of more or fewer Sait, Acid, or Estably Parts therein: And that Fresh-sea-water is rather lighter than River-water, and as light as any common VV ater distill'd, as hath before been provid: The one is as pure and free from all kind

of Salt, Acid, or Earthy Parts, as the other.

From whence, and from its being void of any take or finell, its also easie to conclude, how it is so permanent and incornatible; for in this safe, there can be no Correption without Fermentation, nor any Fermentation where there is no Sulphur, nor any other fermenting Principles to be any way discover'd: to that as the simplicity of this Water is the reason of its Duration; so this, with the Premises, an evident Proof of its pure suff and simplicity; which still may be further confirm'd by the following Experiments.

Let about half an Ounce of Syrup of Violets be diffolv'd in half a Pint of some barls Pump-water; in a short time, the VVater turns the Syrup to a muddy green Colour: This I have known to appear to some Apothecaries, as much to their loss, as their moder, from whence it should proceed. But the Reason was, though they took sufficient Care in picking their Violets, yet

or in the choice of their Water.

Put a few Drops of Oyl of Virial, or Spirit of Sall, to the same quantity of River-water, and then let the same proportion of Syrup of Violeta be dissolved therein, and it presently turns Rurple.

neither green, nor purple, but holds its blew Colour perfect; and

four doth the like if it be diffolv'd in Freft fea-water.

Observing this, I proceeded to make the like Experiment with Charet-wine, which I mixed with several forts of VV ater in some good quantity, as I did the frup; but without any discern-

able difference between them.

flower, confidering that the colour of Claret being very full and strong, might require a much greater proportion of Water to over-rule it; I put three Spoonfuls of Pump-water into a Flim Glass, and drop'd into it not above seven or eight Drops of Charets, which being well mix'd, I perceiv'd, that in a little time after, the Colour, instead of being changed, was wholly vanish'd, and the Water become as clear as before the Claret was drop'd into it. The Alkaline Parts in this Water, destroying the Acid, and therewith the colour of the Claret.

The same number of Drops, being mix'd with the same quantity of Lambs-Conduit water, in a Glass of the like Metal, Bigness, and Shape, the colour, in a short time, did almost, but

not wholly, vanish

Mix'd in like manner with River-water, it gives a few Per-manent Rays of Red, but muddy; as was before observ'd, and

is here again to the prefent purpole. or sale days

But being mixed in the same Proportion, and Glass, with River-water distill'd, gives it a light, clear, and permanent hyacynthine Red.

And the same curious and durable Red it likewise imparts to

From whence, and all that hath been faid before, it appears, To have the clearness and durableness of Spring-water, the lightness or softness of Rain or River-water, the sweetness and simplicity of that which is distill'd: and most word, all the good Quali-

Qualities of the best Water, without any bad one: Which may five to satisfie any reasonable Man, not only to make Tryat of it, but also to prefer it before any other now in use at. Sea.

Yet because Men will hardly be brought to leave a known Road, though a bad one, for a better unknown, till they see some Body go before them; therefore, to discharge all manner of Scruple, I must not omit to add, that there are several Persons of Quality, and others, who have Drunk often and liberally of this Water; and though not much used to drink Water, yet have received no Prejudice thereby. And amongst them, some Water-Drinkers; whom I take to be the most proper Judges in the Case, and who give the Character of it, To be very wholsome; and that it will quench the Thirst, as well as any other ordinary Water.

The Feazibleness of making sufficient quantities of Sea mater Fresh, and the Wholsomness thereof, being granted; The Advantages which will arise from the use of it at Sea, are very ob-

vious; with respect both to Profit and Health.

And first, as to Profit. Suppose the Voyage to be made to Surrat; for which, one Butt of Water, for Drink alone, is the ordinary Allowance for one Man. The Quantity, being always hid in, not only according to the length of this or any other Voyage, but also for a Reserve in case of a Calm; which, if it happen not, they have commonly more than enough. So that if we suppose a hundred Men to be in the Ship, they will require to many Butts for Drink, Whereas, if there be no Wo ter laid in, but only an Instrument to make it, as there is need, The Coals to work it a day and half, that is, to make about a Butt (126 Gallons) of Fresh-water, may be allowed to be something more than a Bushel, which will be the most; or for a hundred Butts, to be about a hundred and ten Bushels. So that one Butt containing fifteen Bufbels, a hundred and five Bufbels will lie in the room of feven Butts. By which means, bout thirteen parts of fourteen now taken up for Water, will be gain'd for Stowage; faving that there must be some few

Cask for receiving the Water as it is wrought off from the Engine. And the like Computation, or near it, may be made with respect to any other Fewel; which may also be used as well as Coal. Besides which, the saving the Charge of the Butts, will be very considerable; the Price of a Butt being twenty Shillings, being bound with Iron.

Belides which, there are other Particulars, relating to Profit, and the preventing of Damages both at Sea, and in Sea-Port Towns; upon which, the Honourable Mr. Fitz-Gerald.

in his late Book, doth very pertinently infift.

I shall therefore conclude with the second great Advantage which will hence arise; and that is, in point of Health. Tis of no Unwholsome Drink, And generally, though not always, good Care is taken in laying it in, both at the best time, which is at half Ebb: and in case of great Trates, above the Bridge, formetimes as high as Chelsey. And though it Ferments and Stinks in the Voyage, yet grows fiveet again: and, as they fay, doth not flink all at one time.

Notwithstanding which, there are very few, who would choose a Suspicious Water, that may have Spring-water, if they will, or that which is as good; or better, if it be true, which fome fay, That in a large Voyage, even some Spring waters will ferment a little. For the mixing with Wine, or any other use, it would be no small Pleasure to the Captain of a Ship, to be fure of that which is the best. And it is as a Rule among the Sea-men, That good Water shall be valued, and go as far as Brandy, when they club together for a Bowl of Punch.

In point of Health; peradventure, while the Thames-water is in the heighth of its Ferment, even the Seamen may forbear to drink it. Yet we have no Reason but to believe, when that is over, before the Water be throughly recover'd, it often gos down well enough with them; who living in so thick and moift an Air, and having their Mouths always fir'd with fall Meats, cannot be very Critical either in their Tafte or Smell. So that though the Scent and Tafte of the Water, with respect to the Sea-men, is not much to be regarded, yet their confiant drinking of a fermenting Liquar, though but for some days, may be of ill consequence, and for that time, the more encline them to Galentures and other Fevers; especially near the Line, where they are more subject to them, and the VVater to its highest Ferment. For the maintaining whereof, there is a considerable stock of Matter in the VVater, how simple so ever it may seem to be. Insomuch, that after any long Vayage, it will Burn, or give a Flash. Whereas Fresh Sea-water, being free from all manner of Instammatory and Fermenting Principles; it can no way conduce to the production of the foremention'd Diseases, but will rather prevent them.

But supposing Thames-water were always wholsom; yet the Water, in many other places, where Ships are often forc'd to take it in, is found to be very bad, and to make the Men sek. An English Ship, the Fantkon, in a late Voyage to Surtat, being upon the Coast of Malabar, was there forced to take in Water; of which, the Men who drank, were taken with Fluxes and Fevers of that ill nature, that of about eighty five in the Ship, thirteen, or near one fixth part, died in a short time, and some languish'd long under dangerous Distem-

And sometimes Ships are brought to that want of Water, as neither to have good nor bad; as in a long Calon: Which though it doth not often continue so long as to Kill the Men; yet, besides the Anguish of Thirst, it sometimes makes way for divers Diseases, as a Surfeit, Dysenteries, on Cholick, upon the

first Immoderate Drinking. To 1 : beat field or you and o

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Sometimes also, it is an occasion of great Danger both to Men and Ship. Not long since, a Ship went to Sea, betwirt Chester and Dublin, pretty well provided with Water: But meeting with a Calm of some Days, the Passengers were forced to Row several Leagues to the Wals Shore; in which time, if a Storm had happened, the Passengers had been lost in the Boat, and the Ship, in all likelihood, had been lost for want of the Hands that were made use of in the Boat.

Nay, it hath been known, that a whole Ship of Men have perish'd for want of Water. About five years since one came in laden with Tobacco from Virginia, in which all the Passengers were found dead; having declar'd in a Writing which they had nail'd upon the Mast, That they had Perish'd for want of Water. All which Mischiess will be avoided by the constant

Supply of Frelh Sea-water.

And not only in point of Drink, but also in Meat; most of which now Eaten's extream falt. For which, all the Care they have at Sea, is to soak it before it is Boil'd; not in freshmeter, but in falt. For if they should use fresh-water, they must lay in near double the quantity, the Meat being commonly shifted once in sour hours, for three or sour times. They say, indeed, that the soaking of it in salt-water, setcheth out the Salt better than in fresh. And for the sirst or second soaking, I believe it may; yet also, that a soak or two in freshwater afterwards, will do best: Which, to keep the Meat from stinking, as at that time it is apt to do, may be done so much the sooner.

But many times the Sea-men are put to such straits, as not only to foak, but also to boil their Meat in falt-water. Which instead of taking any falt out of it, doth rather add to it; because the boiling of the fea-water makes it to become falter.

Now from such Diet as this, what can be expected, but besides the highest Sciences, a Foundation also for Dropsies and divers other Diseases, of which the Patients either dye quickly, or are hereby so far weakned, as with respect to the Publick, to be worse than dead: For a Man that is dead, is but one Man lost; but one that cannot work, is not only lost himself, but also spends upon the Labours of another. All which Mischies will be very much prevented, by having of freshmater enough for all Uses at hand.

And this, not only by emendation of bad Meat, but moreover in altering the very way of Diet: for where there is fresh Water, good Victuals may be made at any time without Flesh. This, with Bisquet, Wheat, or Rice, and a little Sugar, or

Butter, will make very good Food.

I have thus comprized all that is necessary to be said upon this matter, in as few Words as I could, that I might not feered to mif-spend those precious Minuses whereof your Majesty hath fo few to spare: nor should I have presumed to have intrench'd on them at all, had not your Majesty already judged this Subject worthy your Royal Consideration, for the great Usefulness it may be of to Your Forts on Land, and Your moving Castles in the Sea, where also You are Sovereign; and the Advantage it must certainly bring to Navigation, that great Medium that Unites the far distant Parts of your Empire, and makes the whole World in a manner pay Tribute to the Throne of Great Britain. Those that see the Wonders of God in the Deep, when they find Relief in a Necessity, by which they must have perish'd without this Art; will praise your Majesty's Goodness and Care, not only of your own People, but of all Mankind, and will juftly account it a Miracle, that you have railed a never-failing Spring of Fresh-Waters in the midit of the Ocean.

FINIS.